

REMARKS

Status of Claims

Claims 1-8 are currently pending.

Claim Objections

Claims 1-8 are objected to. In claims 1 and 6, line 6 "control" should be, e.g., "driven".

Claims 1 and 6 have been corrected as suggested by the Examiner.

Claim Rejections - 35 USC § 112

Claims 6-8 are rejected under 35 U.S.C. §112, first paragraph. The description and claim 6 each refer to an "elevating phase", see claim 6 line 26 and page 4 line 9 of the specification. It is unclear what portion of the pump operation is being referred to.

In response, Applicants explain that, in place of "elevating phase" the specification refers to "pushover phase P", and this is illustrated in Fig. 3. See paragraph [00017] of the specification as filed "From thereon the diagonal disk 62 pivots again completely into a pushover phase P, so that a pressure is built up in the until now direction of advance, which causes the pipe switch 56 to move out of its starting position A."

The specification and claim 6 have been amended for consistency to refer only to "push-over phase P".

Next, claims 1-8 are rejected under 35 U.S.C. §112, second paragraph.

Claim 1 is considered vague and indefinite because in line 8 it is unclear what "its" refers to and in lines 8 and 10 there is no antecedent basis for "inlet side" or "outlet side".

In response, Applicants amend claim 1 for clarity.

In claim 1 the phrase "wherein the drive cylinders are... connected with a connector ...via...one hydraulic line" is considered confusing. The examiner believes the phrase should set forth that each drive cylinder is connected to an opening of the pump via one hydraulic line.

Claim 1 has been amended according to the helpful recommendation of the Examiner.

In claim 1 lines 13 and 14 it is unclear what "on their other end" refers to.

Claim 1 has been amended for clarity.

In claim 1 line 15 it is unclear what limitation should be between "a for" the examiner believes either a controller or a computer (see line 29) should be referred to.

Claim 1 has been amended to recite "computer supported reversing device".

In claim 1 there is no antecedent basis for: "the pump-side" in line 17, for "the hydraulically actuated pipe switch" in line 18 or for "the reversible pump... hydraulic circuits" in lines 20 and 21.

Claim 1 has been amended.

In claim 1 lines 26 and 32 the phrase "and/or" is confusing because it sets forth multiple alternative structures and it is unclear which arrangement is being claimed.

The phrase has been removed from claim 1.

In claim 1 there is no antecedent basis for: "the pressure sequence" in line 27 or for "the computer supported reversing device" in line 29.

In response, line 27 has been amended and antecedent basis provided for line 20.

In claim 1 line 31 it is unclear if "the position provider" is the earlier claimed "position sensor" and in lines 35 and 36 it is unclear if the "reversing element" is the same as the reversing device which was earlier claimed.

In response, Applicants correct "position sensor" and add reference numbers to clarify the difference between the "computer supported reversing device (18)" and the "reversing element (79)".

In claim 2 there is no antecedent basis for "or encoder" and this limitation should be deleted as redundant.

Claim 2 has been amended.

Claim 6 is vague and indefinite because in line 8 it is unclear what "its" refers to and in lines 8 and 10 there is no antecedent basis for "inlet side" or "outlet side".

In claim 6 the phrase "wherein the drive cylinders are...connected with a connector ...via...one hydraulic line" is confusing. The examiner believes the phrase should set forth that each drive cylinder is connected to an opening of the pump via one hydraulic line.

Claim 6 has been amended.

In claim 6 lines 13 and 14 it is unclear what "on their other end" refers to.

Claim 6 has been amended.

In claim 6 line 15 it is unclear what limitation should be between "a for" the examiner

believes either a controller or a computer (see line 29) should be referred to.

Claim 6 has been amended.

In claim 6 there is no antecedent basis for: "the reversing process" in line 18, "the conveyor process" in line 19, or for "the actuating element" of line 26.

Claim 6 has been amended.

The claims have been reviewed and revised taking care to introduce no new matter. Entry of the amendments, and withdrawal of the rejections, is respectfully requested.

Claim Rejections - 35 USC § 103

Claims 1-5 are rejected under 35 U.S.C. §103(a) as being obvious over in Benckert (US Patent 5,238,371) view of Anderson (US Patent 5,332,366) and Benckert et al (US Patent 5,520,521).

Process claims 6-8 are not rejected over prior art.

Accordingly, to expedite allowance, Applicants have incorporated a characterizing process limitation into claim 1 in the form of a computer routine.

That is, the present invention concerns controlling the reversing process of the pipe switch pipe 56 of a thick matter pump, as shown in Fig. 1 and 2, in such a manner that it is reliable, yet ensures shock damping (to avoid banging and bottoming-out noises when the piston impacts the cylinder end positions). This is accomplished by reducing the amount of hydraulic fluid pumped by the reversible pump 6 in the manner of a ramp ("R" in Fig. 3) when the piston of the thick matter pump is approaching an end position, such that the movement of the piston is slowed down before impacting the end position. Then, when the piston is at the end position, the pumping amount of the reversible pump is briefly rapidly elevated ("P" in Fig. 3), whereby the movement of the pipe switch 56 is actuated. As soon as the pipe switch has moved a bit, the conveyance amount of the reversible pump 6 is again reduced. Finally, it is lowered "through null" – for a reversing of the pistons of the thick matter pump.

The invention is based primarily upon the idea, that not only the pistons in the drive cylinders but also the pipe switch 56 is to be monitored in the course of their movement and are to be reversed with computer assistance taking into consideration the measured temporal displacement course. In order to accomplish this, it is proposed that the pipe switch includes

a position indicator sensing its pivot position, that at least two cylinder switch sensors are provided spaced apart from each other on the drive cylinders, sensing the pistons of the drive cylinders as they pass by, and/or a pressure sensor is provided sensitive to the pressure sequence at the high pressure output of the reversible pump, and that the computer supported reversing device includes a control routine responsive to the output signal of the position provider on the one hand and to the output signal of the cylinder switch sensors and/or the pressure sensor on the other hand for a program-controlled activation of a control element for adjusting the flow-through amount and/or direction of the reversible pump, as well as a reversing element provided in the hydraulic branch of the pipe switch.

More specifically, plotted in the upper diagram of Fig. 3 as a function of time are the switch position 79' of the reversing valve 79, in the center diagram the angle position 80' of the angle sensor 80 and in the lower diagram the angular position 62' of the diagonal disk 62 of the reversible pump 6. Further, there are indicated the points at which the rod side cylinder switch sensors 20 and 20' are addressed by the passing pistons 8, 8' and provide a reversing signal. After the occurrence of the reversing signal at the cylinder switch sensors the piston first travels a lag distance or section x while waiting for the delay or lag in response, the length depending upon conveyance output or as the case may be stroke duration, until the diagonal disk 62 is controlled by the reversible pump 18. The delay provides a ramp in the conveyance amount, which leads to a braking or slowing down of the piston 8, 8'. At the end of the brake ramp the piston is standing still at the cylinder base. From thereon the diagonal disk 62 pivots completely into a pushover phase P, so that a pressure is built up in what was until now the direction of advance, which causes the pipe switch 56 to move out of its starting position A. After the pipe switch has passed a predetermined intermediate position Z, which is signaled by a position sensor 80, the diagonal disk 62 is again pivoted back. The supply of the cylinders 70 or as the case may be 72' of the pipe switch are finally stopped when the end position E of the pipe switch is reached. In this case the directional valve 79 moves to its neutral intermediate position. Finally, the diagonal disk is completely pivoted again so that the return stroke can occur.

As explained in paragraph [0008] of the specification *as filed*, With the inventive means it is possible to conduct the process such that during the reversing process the pivot position of the pipe switch is monitored, that during the concrete conveyance process the position of the piston in the drive cylinders is monitored and that in an end-segment of each

piston stroke the piston speed is slowed down by reducing the conveyance amount as controlled by the reversible pump such that piston is moved with less speed towards the end position, *that in the case of impact of the piston the pressure supply to the actuating element of the pipe switch is reversed and the conveyed amount supplied by the reversible pump in the push-over phase is increased without reversing direction, until the pipe switch has reached a defined intermediate position in its pivot path, that subsequently the conveyed amount supplied by the reversible pump is returned, until the pipe switch reaches an end terminus or makes contact, and that then the flow-through direction of the reversible pump is reversed and the pressure supply to the pipe switch is interrupted via the reversing element or else is maintained by switching.*

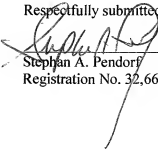
Accordingly, all claims are believed to be in condition for allowance. Early issuance of the Notice of Allowance is respectfully requested.

The Commissioner is hereby authorized to charge any fees which may be required at any time during the prosecution of this application without specific authorization, or credit any overpayment, to Deposit Account Number 16-0877.

Should further issues remain prior to allowance, the Examiner is respectfully requested to contact the undersigned at the indicated telephone number.

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Respectfully submitted,


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Date: April 28, 2009